REMARKS

Claims 1-10 are pending. Claims 1-10 are rejected. Claim 9 is objected to.

Rejection of Claims 2-10 Under 35 U.S.C. §112.

Claims 2-10 are rejected under 35 U.S.C. §112 as being anticipated indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 is amended to distinguish the terms "roller" and "loading roller ring".

Claim 3 is amended to add the term "*" for clarification purposes.

Claim 8 is amended to clarify the limitation "planetary traction drive" and to provide sufficient antecedent basis for the limitation "ratio of K_S to K_R". In addition, the term "chosen" is added for clarification purposes.

Claim 9 is amended to recite "said means", per Examiner's suggestion.

Claim 10 is amended to provide sufficient antecedent basis for the limitation "planetary roller member".

Applicant submits that the claims as amended particularly point out and distinctly claim the subject matter which applicant regards as the invention. Therefore, applicant respectfully requests that Examiner withdraw the rejection of claims 2-10 under 35 U.S.C. §112.

Rejection of Claims 1-8 and 10 Under 35 U.S.C. §102.

Claims 1, 2, 8, and 10 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Pat. No. 5,688,201 issued to *Zhou* (hereafter referred to as "*Zhou*"). Applicant traverses the rejection.

The MPEP states,

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987).

MPEP § 2131.

Zhou does not contain each and every element of claims 1, 2, 8, or 10. In fact, the device in Zhou is an altogether different device used in a different application. *Zhou* discloses a concentric traction drive A with a cone (2), and a cup (4), and a transfer rings (6) arranged concentrically around a center axis X. The concentric design of *Zhou* does not place the transfer rings (6) into a circumferential converged wedge with the cone (2) and the cup (4) to generate normal forces at the contact surfaces. Instead, the transfer rings (6) are pushed axially to be in frictional contact with tapered surfaces (18 and 28) of the cone (2) and the cup (4) to generate normal forces (force S in FIG. 4). As described in Zhou in column 4, lines 5-20, an elastic wave spring (50) places a "preload" on the transfer rings (6) to push the transfer rings (6) more tightly against the tapered raceways (18 and 28).

In direct contrast, the invention embodied in the present application is an eccentric traction drive with wedge loading mechanisms (1) arranged in a

circumferential converged wedge between the outer ring member and the sun roller, which is eccentric to the outer ring member. The wedge loading mechanisms (1) are in frictional contact with the first raceway (2) and second raceway (3) forming a circumferential convergent wedge to generate normal forces. Therefore, the flexible mounting of the present invention is completely inapplicable to *Zhou*, because *Zhou* does not disclose a circumferential convergent wedge.

In light of the above, clearly *Zhou* does not contain "a roller positioned between and in frictional contact with two raceways that form a convergent wedge..." of claim 1. Claim 2 is dependent from claim 1 and therefore, *Zhou* does not contain all the elements of claim 2. Similarly, *Zhou* does not contain "means for flexibly mounting a support shaft within the planetary roller..." of claim 8. In addition, *Zhou* does not contain the step of "installing the wedge loading mechanism into a traction drive having sun roller member into an outer ring member such that the sun roller member is eccentric..." of claim 10.

Since *Zhou* fails to describe at least one element of the claims 1, 2, 8, and 10, applicant respectfully submits that *Zhou* does not anticipate claims 1, 2, 8, and 10. Therefore, Applicant requests that Examiner withdraw the rejection of claims 1, 2, 8, and 10 under 35 U.S.C. §102 (b).

Claims 3-7, and 9 depend from respective base claims 1 and 8, and therefore, incorporate all of the subject matter of respective base claims 1 and 8. Because a dependant claim cannot be anticipated if the independent claim from which it depends is

not anticipated, all other dependant claims of the present application must also be found unanticipated. Since applicant submits for the aforementioned reasons that claims 1 and 8 are patentable over *Zhou*, applicant likewise submits that claims 3-7 and 9 are patentable over *Zhou* for the same reasons. Therefore, applicant respectfully requests that Examiner withdraw the objection of claim 9.

Claims 1-8, and 10 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Pat. No. 3,945,270 issued to *Nelson et. al.* (hereafter referred to as "*Nelson*"). Applicant traverses the rejection.

Nelson does not contain each and every element of claims 1-8, and 10. The flexible mounting of the current invention significantly differs from the elastic spring (45) of *Nelson*. *Nelson* discloses a traction drive with intermediate rollers (9, 10, and 11) in frictional contact with a sun roller (6) and an outer ring roller (8) to transmit rotational motion. The intermediate rollers (9, 10, and 11) include an elastic spring (45), which provides a "preload" to the intermediate rollers (9, 10, and 11), thereby pushing intermediate rollers (9, 10, and 11) more tightly against the sun roller (6) and outer ring roller (8) in a convergent wedge. As described in *Nelson* in column 7, lines 59-64:

> "Roller 9 requires a light energizing force to urge it into initial engagement with surface 7 of ring 8 and surface 32 of ring 6. For this purpose, a spring 45, which is pivotally secured at one end with pin 87 and simply supported against a second pin 88 at the other end, is deflected against the end roller shaft."

This arrangement is similar to other earlier traction drives in that the wedge loading arrangement is based on a specified friction coefficient between the contact

surfaces of the intermediate rollers (9, 10, 11), sun roller (6), and ring roller (8). This requires a specific wedge angle that corresponds to the available friction coefficient in order to generate the desired normal forces. As described in *Nelson* in column 8, lines 53-56:

> "By controlling the wedging angle α in design, a preselected ratio of tangential to normal forces may be specified. The wedging angle can be selected to match the probable coefficient of traction obtainable with certain lubricants, finishes, rolling speeds and Hertz stresses."

In contrast, the invention of the present application relieves this restriction to a specific wedge angle and gives improved flexibility to the traction drive. More specifically, the invention shown in the present application uses the spring action of the elastic insert (5), FIG.5, of the loaded planetary roller (7) to provide a resistance to the loading roller (7) when it is being pushed into the convergent gap between the first raceway (2) and the second raceway (3). In other words, the elastic insert (5) biases the loaded planetary roller away from the small end of the converged wedge between the sun roller and the outer ring. In direct contrast, the elastic spring (45) of *Nelson* biases the intermediate rollers (9, 10, and 11) toward the small end of the converged wedge between the sun roller (6) and outer ring roller (8). This is a significant functional difference between the present invention and *Nelson*.

The resisting action of the present invention is provided to introduce a new independent variable not found in *Nelson*. This new independent variable in the present invention is identified as the "stiffness ratio." The "stiffness ratio" relates to the forces

shown in FIG. 6 of the present application, and is further defined as the ratio between the effective stiffness at contact points A and B (denoted by K_R), and the effective stiffness at the contact area between the loading roller ring (7) and supporting shaft (4) (denoted by K_s). The equations shown in the present application identify a special and unique relationship between this stiffness ratio and the operating coefficient of friction of a traction drive. In fact, this new relationship allows for the design of a traction drive that can be operated under any small wedge angle, while still allowing the traction drive to be operated at or close to the maximum available friction coefficient, so long as the stiffness ratio is appropriately chosen as provided by the equations of the present application.

Therefore, the uniquely defined variable "stiffness ratio" offered in the present invention is used to govern the balance between the operating friction coefficient and the available friction coefficient. Because of this "extra" degree of freedom, it is possible to assemble the loading roller at a wider range of possible wedge angles while keeping the friction drive at its top performance. This is a significant functional difference between the present invention and *Nelson*.

As shown above, the mathematical relationships set forth in the present application are inequality constraints – not simply equilibrium equations used to discover an optimum value. When these constraints are not met, the friction drive may malfunction or function properly only at a certain wedge angle of δ_0 degrees as determined by the available friction coefficient. However, when the inequality

constraints as described in the present invention are met, the friction drive will perform properly at any desired wedge angle between 0 degrees and δ_0 degrees. Thus, rather than simply identify conditions of general equilibrium, the equations shown in the present application provide a new method by which the new independent variable of stiffness ratio is considered, and this new independent variable offers a novel way of designing more efficient traction drives.

Finally, the embodiment of the present invention as shown and described in the present application utilizes the above equations that consider the new stiffness ratio, and incorporate that determination in a new design used to mount the loaded planetary bearing. This new design incorporates a flexible mounting that incorporates the elastic insert (5) (FIG. 5) and the resiliency of the elastic insert (5) can be determined through the evaluation of the equations in the present application based upon the operating friction coefficient μ_0 in conjunction with the desired wedge angle.

It should also be noted that traction drives are a form of friction drives, and that a friction drive is at its peak efficiency when operated at the maximum available friction coefficient. To take full advantage of the friction force available in a traction drive power transmission, it is desirable to have the actual operating friction coefficient set close to, but just slightly smaller than, the maximum available friction coefficient at the frictional contacts of the traction drive. Because the operating friction coefficient of the friction drive can be adjusted by altering the support to contact "stiffness ratio" for a given

geometrical configuration, the derivation and application of the equations identified in the present application that incorporate the new concept of "stiffness ratio" offer a unique and practical means to optimize the design of a particular traction drive. A thorough review of *Nelson* shows that this new stiffness ratio is not suggested or disclosed in any way, nor is that ratio inherent in the design of the device in *Nelson*.

In light of the above, clearly *Nelson* does not contain each and every element of the claims 1-8, and 10. Specifically, Nelson does not contain "a flexible mounting that generates a difference between an effective supporting stiffness K_S of the roller and an effective contact stiffness K_R..." of claim 1. Similarly, *Nelson* does not contain "means for flexibly mounting a support shaft within the planetary roller such that said means generates an effective supporting stiffness K_S of the planetary roller and an effective contact stiffness K_R..." of claim 8. In addition, *Nelson* does not contain the step of "manufacturing a wedge loading mechanism having a flexibly mounted supporting shaft..." of claim 10.

Since *Nelson* fails to describe at least one element of the independent claims 1, 8, and 10, applicant respectfully submits that *Nelson* does not anticipate claims 1, 8, and 10. Claims 2-7 depend from respective base claim 1, and therefore, incorporate all of the subject matter of respective base claim 1. Because a dependant claim cannot be anticipated if the independent claim from which it depends is not anticipated, dependant claims 2-7 of the present application must also be found unanticipated. Since applicant submits for the aforementioned reasons that claim 1 is patentable over *Nelson*,

applicant likewise submits that claims 2-7 are patentable over *Nelson* for the same reasons. Therefore, Applicant requests that Examiner withdraw the rejection of claims 1-8, and 10 under 35 U.S.C. §102 (b).

Similarly, claim 9 depends from respective base claim 8, and therefore, incorporates all of the subject matter of respective base claim 8. Because a dependant claim cannot be anticipated if the independent claim from which it depends is not anticipated, dependant claim 9 of the present application must also be found unanticipated. Since applicant submits for the aforementioned reasons that claim 8 is patentable over *Nelson*, applicant likewise submits that claim 9 is patentable over *Nelson* for the same reasons. Therefore, applicant respectfully requests that Examiner withdraw the objection of claim 9.

Conclusion.

Applicant believes the above analysis and the amendments made herein overcome all of the Examiner's objections and all of the Examiner's rejections of claims 1-10 and that Claims 1-10 are in condition for allowance. Therefore, applicant submits that claims 1-10 constitute allowable subject matter and should be favorably considered by the Examiner, and issue a timely Notice of Allowance for those claims.

The Commissioner is hereby authorized to charge any additional fees or credit overpayment under 37 CFR 1.16 and 1.17, which may be required by this paper to Deposit Account 162201.

Respectfully submitted,

Date: March 11, 2005

Scott Anthony Smith, Registration No. 46,067
POLSTER, LIEDER, WOODRUFF & LUCCHESI, L.C.
12412 Powerscourt Drive, Suite 200
St. Louis, MO 63131-3615
Telephone: (314) 238-2400
Facsimile: (314) 238-2401